1859 PUBLISHED WEEKLY 1920

MANUFACTURING. DISTRIBUTION

COMMERCIAL INDUSTRIAL

AMERICAN GAS ENGINEERING JOURNAL

FORMERLY

AMERICAN GAS LIGHT JOURNAL

VOL. CXIII., No. 23
WHOLE No. 3274

NEW YORK, SATURDAY, DECEMBER 4, 1920

Subscription $3 per year
$4 Canada $5 Foreign

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Entered as second-class matter January 9, 1917, at the post-office at New York, N. Y., under the Act of March 3, 1879.

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Vol. CXIII, No. 23 NEW YORK, DECEMBER 4, 1920 Whole No. 3274

Will Recommend Federal Regulation of Coal Industry As Only Solution of Vital Problem of Supply

Senate Investigating Committee to Present Bill at Next Session Providing for Government Control of Output

The attention that the coal situation is receiving from the United States Government through investigating committees is one of the best indications possible that this problem, which has caused a great deal of worry in the gas field, is going to be solved so that the best interests of all concerned will be served.

Perhaps the most important of all of the committees that are at work is the Senate investigating body headed by Senator William M. Calder. Hearings in which coal-mine operators, wholesalers and retailers participated have been held, with the result that Senator Calder has declared himself in favor of Federal regulation of the coal producers.

In an interview on this subject Senator Calder stated that his committee would draw up a bill which would provide for the regulation of coal. Just what form this bill will take, or its exact provision, Senator Calder would not state, but he contented himself with declaring that his investigations had convinced him that such a move is essential if the price of coal is to be brought down.

The Senator also put himself on record as having found evidence of profiteering in this necessity, which is so vital to the well-being of our field.

Without entering into a discussion of the recommendation, it might be said that Senator Calder is recognized as one of the most conservative members of our law-making bodies and his recommendation will be received with great respect in Washington. Senator Calder—a Republican, by the way—was consistently opposed to Government regulation and operation of the railroads, so that his position in this matter is based, according to the best information obtainable, on the facts which were brought out at the hearings held by his committee.

Found Profiteering

"The evidence which we adduced," said Senator Calder, "showed conclusively that there had been and still is profiteering in coal. This product is too vital to the well-being of our people to allow this condition to continue. We must stop it at once, and the only way in which this can be done, it seems to me, is by Government control."

Pressed for a statement as to the nature of this control Senator Calder refused to commit himself, but it was surmised by those who had followed the course of the hearings closely that the coal industry would be placed under the jurisdiction of a body similar to the Interstate Commerce Commission.

Effect on Gas Industry

What effect this would have on the gas industry was a natural question, and this was put to several heads of large companies. The opinions received were almost unanimously against the regulation, and well-informed men in our field went so far as to declare that this regulation would stifle the natural and normal development of the gas business.

"Practically every man in the gas field has decided that the day of water gas is done," stated one man. "Now a large proportion of the companies naturally will turn to coal gas, with the result that we will have to have closer relationship with the coal operators. Now, in order for them to serve us intelligently it is going to be necessary for them to study our needs closely and to supply us with exactly the kind of coal needed. If, however, there is another market for the same commodity at a better price—and it follows naturally that there will be, for gas companies probably would not be able to meet competition on price—mine operators naturally are going to ignore us, except for such qualities of coal as are not desirable for general commercial and domestic use."

Says Problem Will Settle Itself

Another well-informed man in the field asserted that he believed that the coal problem will right itself in the ordinary course of events.

"Like everything else," he said, "the war created a demand for coal that was absolutely unprecedented in this generation, so that the price was made largely by the law of supply and demand. Of course,

the cost of labor entered into this question, and I believe that the Senate investigating committee could well devote some of its hearings to labor and its demands. This is the one factor, in my opinion, that is going to make for high prices and which may cause a great deal of trouble in the gas field; for it is natural that this cost will be passed on to us by the coal-mine owners, and we in turn, if we are to continue to exist, must secure a higher rate from our consumers.

"Let wages come within reason—and I believe that in the coal industry they are entirely too high—and the price of coal automatically will drop. If it doesn't, then it will be time enough for the Government to step in.

"As to profiteering, undoubtedly there has been some going on, but I believe that this has existed only in isolated cases and has not been a general practice. True, the price of coal seems to have been out of proportion and excessively high, but this has been due mostly to the buyer rather than the seller. When a buyer starts to 'wildcat' his orders, then it follows that there will be a shortage in certain sections of the country which ordinarily does not exist. Let this condition become widespread, as it has done, and at once there is shortage that affects the whole market.

Railroads Partly Blamed for Shortage

"There is another feature to the question which, it seems to me, is well worth bearing in mind, and that is the lack of transportation facilities. This has been caused, if we care to trace it back to its source, by the Government operation of railroads. When the roads were turned back to their owners it is a well-known fact that the rolling stock was in bad condition and that this has resulted in a shortage of cars. Now, as a general rule, there are no facilities at the mines for storing a large quantity of coal, so that it has been impossible to mine enough to care for all. Were the railroads in a position to move the coal, then the mines, which, according to reports, have been operated only part time, could be worked continuously, with the result that there would be an abundance of coal."

Competition Will Lower Prices

Discussing this phase of the situation, another gas company executive declared that with all mines able to move their products rapidly and easily the coal market would once again become a competitive market, with each wholesaler fighting for business.

"Let this condition become general," he added, "and prices will be forced down by the coal men themselves. Then there will be no need of Government regulation.

"As to the question of profiteering, it seems to me that there are enough laws already on our statute books to allow for the prosecuting of any company or corporation that attempts to extort excessive profits. If there are not, then don't only confine this regulation to coal but let the bills be passed in such form as will aid in stopping these other lines of business from growing rich at the expense of the public."

Smacks of Paternalism

That the question of paternalism enters into the coal regulation is the opinion of still another experienced gas man.

"The American public is well able to care for itself," asserted this man in discussing the situation. "Take my own community as an example. I personally was a leader in a movement in my town to force down prices, and I want to tell you we didn't need any laws to back us up. The law of public opinion was enough for us to win our point without a great deal of difficulty. We didn't ask the Government to step in, in a fatherly fashion, and declare that we must be given a fair shake on the price question. Rather we decided where a price was high, and then we took steps to lower it. True enough, in some cases we had recourse to the law and prosecuted those who refused to listen to reason, and we found that these laws covered practically every case in which we invoked them; but that was just in the ordinary course of our campaign.

"If this coal regulation becomes a law we will probably have a price fixed for the commodity, which will vary under different conditions. Gas companies, even with an increased rate, probably will not be able to pay these prices, and the result will be that we will be thrown back into a condition resembling that which existed during the war. It will only be a starting point for a new increase in the cost of living that will start with public utilities. I am definitely opposed to this proposed regulation.

"There is another side to the question also that must be taken into consideration, and that is the mine labor. If a price is fixed which will allow for the high scale of wages demanded by the miners, then this becomes class legislation, and that is absolutely opposed to our form of self-government. We had an example of the way in which the Government handles a labor problem, and I don't think we want any more. I say this in the face of the refusal of President Wilson to grant the demands of the miners just prior to the last election. Different times in the year bring different conditions, with results that cannot be foreseen. No, such regulation as that which has been proposed is contrary to good government, in my estimation."

Efforts to present these views to members of the Senate committee were unavailing, and so no answer could be secured from them to the arguments advanced.

The question, however, is of too great importance to the gas industry to allow it to be presented to the coming session of the Houses of Congress without some expression on the part of the leaders of our industry. The gas field is among the most important users of coal, and a law of this kind should receive the consideration it merits, for it is more than a possibility that it will cause a great deal of trouble for gas companies.

It has long been a cry on the part of some gas companies that their product has been regulated in price but that the raw materials used in manufacture have been purchased in the open market and on a fluctuating scale. This is true to a large extent, but it has been as a wholesale user that gas companies have bought and it was not until the Government entered the market in competition with individuals

(*Continued on page* 476.)

U. S. Scientists Seek Method to Control Sulphur in Gas*

Alfred R. Powell Reveals Findings of Bureau of Mines in Its Study of Coal Sulphur and Its Conversion in the Gas Retort

Every gas man knows that sulphur is always found in coal in quantities varying from 0.5 per cent up to 3 or 4 per cent and that when this coal is subjected to destructive distillation a portion of the sulphur finds its way into the gas in the form of hydrogen sulphide or fixed sulphur compounds while another large portion is retained in the coke, declared Alfred R. Powell, of the United States Bureau of Mines, at Pittsburgh, in an American Gas Association paper. The mechanism of this conversion of the sulphur of the coal into gaseous sulphur compounds and the conditions which determine the amount and character of these compounds in the gas has never been studied to any great extent, however. Such knowledge would be necessary before any possible attempt might be made to modify conditions in the gas retort so that, for instance, the amount of sulphur in the coke could be decreased, the amount of sulphur in the gas decreased, or the character of the sulphur compounds in the gas changed so as to secure more efficient purification.

Working toward this end, the Bureau of Mines has made a study of the changes which the sulphur in coal undergoes when heated as well as any secondary changes which might occur in the coal gas retort. These studies have been made in the laboratories on experimental coal gas retorts and on by-product coke ovens.

Sulphur in Coal

Sulphur is now known to exist in coal in three typical forms—pyrite or marcasite, with the formula FeS_2, organic sulphur, the exact chemical composition of which is not known, and sulphates. Fairly accurate methods have been devised for the determination of these various forms.

The organic sulphur content of coal will vary from 0.5 per cent up to 2 per cent, although it is present in a constant proportion in coal from the same general locality. Pyrite, FeS_2, comprises nearly all the remainder of the coal sulphur and is unevenly distributed through the coal bed. The coarsely divided pyrite may be removed from coal by washing processes, but the finely divided pyrite and the organic sulphur cannot be removed by any known means. Sulphates are present in freshly mined coal in almost negligible quantities but may increase as the coal is allowed to stand, due to oxidation of the pyrites.

Reaction of the Coal Sulphur During Carbonization

Since the combinations of the sulphur in the coal were known, as well as means for the analysis of these forms, it now was possible to study the changes undergone during the carbonization of the coal. For this study it was impossible to use a gas retort since here the heating and consequent carbonization proceeds in zones through the retort cross section making impossible accurate temperature control. Furthermore, secondary reactions would occur due to the passage of volatile products through zones undergoing another stage of carbonization.

Because of these facts, it was decided to use a small tube containing five grams of the finely powdered coal and so arranged that the volatile products resulting from the carbonization could be swept out as fast as formed. Heat was furnished by an electric tube furnace capable of close temperature control. The tar was collected on a steam jacketed cotton filter, the hydrogen sulphide was removed and determined by an ammoniacal cadmium chloride solution with subsequent iodometric titration, and the carbon bisulphide was collected in alcoholic potassium hydroxide.

In each case different samples of the same coal were heated to 300, 400, 500, 600 and 1,000 deg. Cent. In this way the effect of each stage of the carbonization could be studied. During each run the temperature was raised at the same rate as takes place in the average coal gas retort

Tests were made for the presence of carbon bisulphide in the volatile products by passing them through alcoholic potassium hydroxide, which was later boiled, acidified, and treated with copper acetate. The formation of a reddish brown precipitate of copper xanthate indicates carbon bisulphide in the gas. In certain runs the referee's total sulphur apparatus was placed at the end to detect any sulphur compounds not determined as above, but no measurable quantities were found.

Analyses of the residue in the tube were made for undecomposed pyrite, sulphate, sulphides, such as ferrous sulphide and calcium sulphide, and organic sulphur or the carbon-sulphur combination of the coke which will be mentioned later.

Since pyrite is one of the main sulphur constituents of coal and since mineralogical pyrite may be obtained in a fairly pure form, a study of the pyro-decomposition of pyrite alone was considered important. The decomposition of pyrite at 500 deg. Cent. was found to be very slow but proceeded rapidly to completion at 1,000 deg. Cent.

The following table gives the changes undergone by the pyrite when heated. The results are expressed in per cent sulphur on the basis of the weight of mineralogical pyrite used.

Table I—Analyses of Pyrite Before and After Decomposition at 1,000 Deg. Cent.

	0 Deg. Cent.	1,000 Deg. Cent.
Pyritic sulphur	48.52	0.00
Sulphate sulphur	0.16	0.00
Free sulphur	0.00	21.88
Sulphide sulphur	0.00	24.24
Sulphur as H_2S	0.00	2.56
Total sulphur	48.68	48.68

These results show that pyrite decomposes to form ferrous sulphide and free sulphur, according to the following equation:

$$FeS_2 = FeS + S$$

The formation of a small quantity of hydrogen sul-

*Report No. 196-H24, published by permission of the Director of the United States Bureau of Mines.

phide in place of an equivalent quantity of free sulphur is accounted for by the presence of a small amount of water vapor or organic matter. As a matter of fact, when the pyrite was mixed with coal or when hydrogen was passed over it as it was heated, no free sulphur was produced, but the pyritic sulphur divided equally between ferrous sulphide in the residue and hydrogen sulphide in the volatile matter. The ferrous sulphide is stable and does not evolve sulphur, even at the highest temperatures of carbonization.

Ferrous sulphide produced by the decomposition of pyrite is slightly magnetic and leaves a faint cloudiness of free sulphur when dissolved. This slight excess of sulphur over that called for by the formula FeS was formerly explained by assigning the formula Fe_7S_8 to the sulphide but it has recently been shown that this pyrrhotite is nothing but a solid solution of sulphur in ferrous sulphide. When pyrite is heated alone, this excess sulphur is very small in amount, and when the pyrite is heated in the presence of hydrogen, the amount is negligible. For this reason we are safe in saying that the sulphur existing as pyrite in the coal splits exactly in half, one-half remaining in the coke and the other half entering the gas as hydrogen sulphide.

The sulphur distribution of several coals was studied by the laboratory procedure outlined above, but for the sake of space economy as well as for the fact that all the coals behaved essentially alike, we shall give here only the results on one very high sulphur coal, which has stood some time after being mined and consequently contained an appreciable amount of sulphate sulphur. This coal was from Morgan County, Tennessee, and analyzed 39.05 per cent volatile matter, 7.80 per cent ash, and 4.25 per cent sulphur. The results are given in the following table:

TABLE II—DISTRIBUTION OF SULPHUR IN TENNESSEE COAL NO. 21100

Values Given in Per Cent of Original Air-Dried Coal

	0 Deg. Cent.	300 Deg. Cent.	400 Deg. Cent.	500 Deg. Cent.	600 Deg. Cent.	1,000 Deg. Cent.
Pyritic sulphur..	1.75	1.75	1.42	0.31	0.00	0.00
Sulphate sulphur	0.71	0.55	0.44	0.01	0.01	0.00
Organic sulphur.	1.79	1.63	1.51	1.70	1.87	1.81
Sulphide sulphur	0.00	0.13	0.44	0.93	0.82	0.84
Sulphur as H_2S.	0.00	0.19	0.39	1.20	1.39	1.44
Tar sulphur.....	0.00	0.00	0.05	0.10	0.16	0.16
Sulphur as CS_2..	0.00	0.00	0.00	0.00	0.00	0.00
Total sulphur..	4.25	4.25	4.25	4.25	4.25	4.25

From these results on the distribution of the coal sulphur, the various reactions may be deduced. In the first place we had already proved that pyrite decomposes to form ferrous sulphide and hydrogen sulphide, so that, as the pyritic sulphur decreases we may assign one-half to the "sulphide sulphur" column and the other half to the hydrogen sulphide column. Furthermore, as the sulphate sulphur decreases we can assign all of this to the "sulphide sulphur" column. We find in every case that the hydrogen sulphide found is greater than that coming from the decomposition of the pyrite, and since the sulphur of the pyrite and sulphate has all been accounted for, we must look for the source of this hydrogen sulphide in the organic sulphur of the coal.

The small quantity of sulphur found in the tar is present as organic compounds which are probably primary decomposition products of the organic sulphur in the coal. The remainder of the organic sulphur of the coal, that is, that portion which does not decompose to form hydrogen sulphide or the tar sulphur compounds, undergoes a decided change in character at about 400 deg Cent. This form of sulphur in the coke has none of the characteristics of the organic sulphur of the coal, although for convenience it has been placed in the organic sulphur column of the above table. The indications are that it is a very stable union of sulphur with carbon, but it cannot be stated whether this union is physical or chemical.

The reactions given above will explain all the changes observed in the sulphur constituents with one exception. From 400 deg. up it will be noticed that the sulphide sulphur is not present in sufficient quantity to account for all the sulphides resulting from the decomposition of the pyrite and the reduction of the sulphates. This same disappearance of sulphide sulphur has been noticed in every coal carbonized, and since this sulphur remains in coke, it must pass over into the carbon-sulphur combination previously mentioned. This rather unusual conversion of the ferrous sulphide into the carbon-sulphur combination may not be of particular interest to the gas man, but from the standpoint of coke manufacture it is important.

It will be noticed that no carbon bisulphide could be detected in the primary volatile products. This bears out the commonly accepted theory that carbon bisulphide is formed by the action of hydrogen sulphide on red coke and is not a primary carbonization product. This fact has been brought out previously by the results of low temperature coking practice, where no carbon bisulphide is found in the gas.

The conclusions to be drawn from the results obtained on primary sulphur reactions are as follows: The pyritic sulphur of the coal divides exactly in half, one-half remaining in the coke and the other half being evolved as hydrogen sulphide in the gas. One-fourth to one-third of the organic sulphur of the coal is evolved in the volatile matter, mainly as hydrogen sulphide. The remainder of the organic sulphur remains in the coke as a very stable carbon-sulphur combination. Any sulphate sulphur present in the coal remains in the coke. It can therefore be seen that a large portion of the pyritic sulphur enters the gas than the organic sulphur, if the primary decomposition reactions only be considered.

SECONDARY EFFECTS WHICH INFLUENCE THE AMOUNT AND CHARACTER OF THE SULPHUR IN GAS

Fixed sulphur compounds are found in coal gas in quantities ranging from 10 to 50 gr. per 100 cu. ft. or higher. Carbon bisulphide comprises the greater part of this impurity, although traces of thiophene, thioethers and isothiocyanates have been found.

The gas from low-temperature coking processes contains no carbon bisulphide, neither does that from the laboratory experiments just described. These are essentially processes in which secondary decompositions play very little part.

As further proof that carbon bisulphide is formed by the passage of hydrogene sulphide through red-hot coke might be mentioned the comparison between horizontal

(*Continued on page* 474.)

Future Interests of World Demand Present Realization of Oil Problem, Declares United States Authority

George Otis Smith Describes Relationship of Power to Oil Supply—Says We Have Coal for 57,000 Years

The world needs more power, declared George Otis Smith, director, United States Geological Survey, before the American Petroleum Institute at Washington, D. C. The central theme of modern history has been man's increasing use of mechanical power. To-day the electric crane, the automotive truck, the motor-driven washing machine are symbols of the new era for labor, and the touring car, the electric light, and the electric fan minister no less acceptably to our comfort. An abundance of cheap power thus means for mankind work with a minimum of toil and living with a maximum of comfort. *Motor* is a fairly new word in our everyday language, but its universal use is a true index of our dependence upon prime movers. Yet it remains for the world to be moto-driven to the degree that would balance the need of humanity for increased productivity. The economic law of this power demand is tersely expressed in an editorial heading in a recent issue of the technical journal *Power*—"Horsepower per Manpower Is a Measure of Modernism."

For present and future sources of energy we have to look to flowing water and the mineral fuels, and in planning for the future we do well to study the world's allotments of these sources. One of the by-products of the co-operative efforts by the Government scientific bureaus in aid of our peace commission was an inventory of the water-power resources of the world, and this is now being prepared for publication by the United States Gealogical Survey. It shows that only about one-twentieth of the potential power of the world's rivers has been utilized, and over half of this in North America, with Europe credited with one-third and the rest divided between Asia, South America, Oceanica, and Africa, in the order named. In its potential resources, however, Africa ranks not last, but first; it has over 40 per cent of the world's supply of water power and is followed in turn by Asia, North America, South America, Europe and Oceanica.

In the division of coal resources among the continents, at least of the better grades of coal, similar inequalities are seen: North America has more than half, Asia about a quarter, Europe a sixth, and the rest is divided between Oceanica, Africa, and South America, in the order named.

The present realization of the world's interest in its supply of petroleum has led to similar estimates of the recoverable resources, first in the United States and then in other countries; and whether we dignifiy these quantitative measurements of oil reserves by terming them officials estimates or describe them by calling them scientific guesses, they are the best we have, and they will serve fairly well in guiding national and international action.

Oil Supply Evenly Balanced

It may be noted that the United States Geological Survey's estimate of the petroleum resources of the world shows that the distribution, while unevenly balanced among nations, is evenly balanced between the eastern and western hemispheres, although the northern hemisphere appears to have at least five times as much oil as the southern. This preponderance of the oil supply of the northern hemisphere should, however, be discounted by a fact and a possibility; the land area of the northern hemisphere is three times that of the southern and the larger unexplored areas are in South America, Africa and Oceanica.

Accepting the Stebinger-White distribution of the world's oil reserves, we may roughly set down the continents in order of wealth in oil as North America, Asia, South America, Europe, Oceanica and Africa. In terms of regional distribution, more than half the world's oil reserves are believed to be concentrated in two intercontinental areas; one of these oil-rich provinces includes the North American and South American countries bordering the Caribbean Sea, and the other includes the countries of western Asia and southeastern Europe, with the Caucasus as an axis. On these two areas, then, each comprising only about 2 per cent of the earth's surface and each containing about 30 per cent of the world's future supply of oil, is focused the attention of the great nations that most need oil.

The resources of the world's oil shale are far too large to be lost sight of as a substitute source of oil. The United States alone is believed to possess deposits of oil shale that contain at least ten times as much oil as there is natural petroleum available in North America, but oil won by mining and distilling these shales, situated in the interior of a continent, cannot enter the world's markets as labor-cheap as the petroleum that flows from Mexican wells close to the coast. Such resources must therefore be regarded as a rear line of economic defense and as a source of power that will be of greater value to other generations than to this, even if a more general utilization of oil shales begins in the near future. No other continent is known to have resources of oil shale at all comparable with those of North America.

America Takes First Rank

In this rapid review of the world's sources of energy we see North America taking first rank among the continents, with Asia a close second and Europe a poor third, although we should remember that Europe has a much smaller area than either of the other two.

Now, in considering how the world may best manage its ever-increasing power load, some aid may be found in a few comments on the differences between these

three sources of energy—water, coal and oil. Man has learned how to harness flowing water with great efficiency, but even in Europe and North America only about one-fifth of the potential power has yet been developed. To that extent only have we succeeded in "borrowing the might of the elements for the use and convenience of man," but we may expect our rivers to take on an even larger share of the base load in any power program that seeks to conserve the energy supplies in coal, oil and men. Of course, even with wisest utilization, coal must again take up the burden as full development of water power is approached, for coal is the world's great source of heat and power, and the largest development of water powers is practicable only with coal power as the dependable standby, ever ready to meet promptly any special demand.

Oil and natural gas are the popular fuels, regarded as highly efficient because they are pre-eminently labor saving—easily produced, easily transported, and easily used. As source of power these fluid fuels present a marked contrast with water. Hydroelectric energy is even more easily distributed and used, but water-power development involves large capital outlay and in any national emergency no quick response in water power is possible; the water-power projects planned to meet the power needs discovered in the course of our war-time expansion of industry are even now hardly under way. But when the large necessary investment of labor and material is once made in water power the output of energy continues for generations. Oil and gas, on the contrary, are quickly developed and quickly exhausted. Already we realize that natural gas, the ideal fuel, is a resource so temporary that its use forms merely an incident in industrial progress; it has been a wasted as well as a wasting resource. The sorry lesson we have learned in natural gas may have its value if we apply the truth to our use of oil. Unless we check the increase in the consumption of oil it too will be but a flash in the pan.

If we leave the world point of view for a moment and look at the power problem in our own country we are able to see in more detail the relative position of water, coal, and oil as sources of energy. Millions of horsepower, thousands of billions of tons, and billions of barrels are the measures of our nation's wealth in these three resources, yet no comparison is possible except as we reduce these units to a common denominator—something more expressive of true value, which is their use by man. Indeed, such statistics of quantity are too large to be grasped unless we translate them into some kind of national units.

Compares These National Resources

To compare these three resources, then, we may start with the country's present total power requirements: If we take 50,000,000 h.p. as an average figure for the potential water power of the United States, without storage, we find that if fully developed and if used as the average load factor of to-day our rivers and streams would just about meet the country's present needs and would supply that amount of power for all time; moreover, with storage and an improved load factor, they could provide a considerably increased output of energy to meet the growing demand.

If, however, we should put the whole burden on our coal mines, not using even the water power now used, we would find that by adopting the best steam practice of to-day the present power requirements of this country could be met with coal for 57,000 years, although we know that long before the end of that period the greater depth of the coal mines and their increased distance from market would alone create power demands for mining and transportation that would considerably cut down the amount of power available for other uses.

The comparison becomes more striking and instructive when we consider the adequacy of the petroleum reserves of the United States to drive the prime movers of the country. Again adopting the best steam practice of to-day as known in the largest public utility stations where fuel oil is used, and trying to carry the whole power load of the country with oil alone, we find that the oil reserves of the United States, although measured by billions of barrels, would last only nine years and three months. Without allowing for the fact that steam raising for power is but one of the many uses of coal, these two figures—57,000 years and 9¼ years—are sufficiently impressive to make us fairly receptive to the general truth of Mr. Eckel's statement in his recent book, "Coal, Iron and Wood": "We have just as much real chance of replacing coal by oil as we have of finding enough gold to use it in place of steel."

Granted then, that we have not enough oil to permit its use where either coal or water power can be had, we face the question of priority in use. First in any priority list must stand essential uses, in which there are no adequate substitutes. In view of the rapid increase in the employment of machinery first thought should be given to the unique function of oil—that of saving power. The world will always need a supply of lubricants, and as the demand will be an increasing one no adequate substitute for the lubricating oils and greases now derived from petroleum appears to be available. The claim of illumination for priority is less well established if we regard the future, for the kerosene lamp and even the fixtures burning oil gas or enriched water gas must eventually give place to the electric light as this world of ours is more and more covered with a network of transmission lines. At least we may set down this use of petroleum products as of larger importance at present than in the future.

The real competition comes in the relative claims of automotive gasoline and of fuel oil, for the larger yield of gasoline through more efficient cracking is gained at the expense of the fuel oil content of the crude oil. This is conclusively shown in the statistics collected by the Bureau of Mines, for in the last four years the fairly constant gain in the percentage of gasoline yield is offset by a similar loss in the yield of fuel oil and gas oil. These two uses are to that extent already rivals, and we may expect refinery practice to be responsive to the automatic control of prices, which in turn ought to express relative demand. Some of us are optimistic enough to hope to see in high prices the agency that will help to bring about a kind of economic survival in which the more essential use gets the larger fraction of the crude oil because it can pay the higher price. But public opinion and, if needed, even governmental regulation should aid in enforcing obedience to this democratic rule of the greatest good to the greatest number for the longest time.

Priority in Use of Petroleum Products

The "flash point" in any discussion of priority in the use of petroleum products is reached when any curtail-

ment in the use of gasoline by pleasure automobiles is suggested. Yet by every known rule of determining priority the nonessential use is the first to be regulated, and this use of a petroleum product as a luxury can find no economic justification in comparison with its commercial use. A more logical plea for motor fuel can be made, however, by the trucks that already form so large a part of our distribution system and the tractors that by the million will soon be helping to meet the world's increased demand for food. Truck and tractor must be given the first places in the long line of automobiles seeking motive power at the gasoline station.

Fuel oil has won favor as a source of power for transportation because it has been relatively cheap, is easier to handle, and occupies less space than the equivalent heat units in the form of coal. In these respects fuel oil is superior for use in transportation, and this use deserves priority over that for firing sttionary boilers, for which coal should be substituted. Indeed, thoughtful regard for the future leads us to disallow even the claim of steam locomotives for fuel oil, for electrification of the railroads by water power alone or from water-power stations and steam stations linked together is now the obvious way to make the best use of our resources of expendible fuel. Austria, bankrupt in fuel, having lost her coal and oil, has begun to electrify half her railway mileage. Shall other nations wait until they too are bankrupt in oil before awaking to the need of a change in sources of power The program of conservation through electrification has started, and while this simply emphasizes our future dependence in larger measure upon coal, it should at once make us abandon fuel oil as a source of motive power for our railroads and industries. In a word, the world has not oil enough to burn under either stationary or locomotive boilers.

Yet in acknowledging the superior claim of the marine use of fuel oil, this priority must be qualified by the condition that even on the seas the best use should be made of the invaluable fuel. The marine steam engine, even of the turbine type, must give place to the heavy-oil engine, under the rule of getting the most out of a limited resource. The very facts that support the argument for the marine use of fuel oil—greater efficiency and economy of space and labor—can be cited in favor of the internal combustion engine of the Diesel type as against the steam engine. The increased thermal efficiency of the new engine with its resulting addition to available cargo space or to cruising radius, is more than two and a half times that of the steam engine. The experience of the Bethlehem Steel Company is that their new oil engine ore carrier, the "Cubore," in continuous service between Cuba and Sparrows Point, Md., uses only 36.7 per cent of the fuel oil consumed by a sister ship differing only in that it has the most modern type of steam plant. The tremendous economy thus possible in the marine consumption of fuel oil demands the immediate adoption of internal combustion engines if the world wants to make the largest use of its oil resources for the longest time.

The century just past has witnessed the conquest of distance. Glance at the roll of the conquerors who have brought the remote nations of the world closer together than the thirteen colonies were in the days of Washington—the clipper ship, the transoceanic cable, the ocean liner, the transcontinental railroad, the wireless telegraph, the oil-burning steam turbine, and now the Diesel engine. Each of these has played its part in tying together the hemispheres, until at least a physical basis has now been established for a neighborhood of nations.

Commerce is more than exchange of commodities; it is the intercourse of nations, and through commerce nations associate. Oil as the best servant of commerce thus takes on large international interest. The same factors that make oil absolutely essential for naval use qualify it for merchant marine strategy. Observers who are keenest in watching for war clouds on the distant horizon see in the world's growing need of oil and the uneven distribution of the world's supply the promise of war. Yet we are warranted in looking upon oil as also a possible agency of peace, for by permitting lowest-cost operation of the merchant marine, it promotes the broadest intercouse between nations. Economic blockade is a war measure, but an expanding commerce should link the nations together in a chain of world peace. I do not forget the tribute paid to petroleum as the very lifeblood of war nor the estimate put upon its large part in winning the recent victory, yet it is possible also to think of its content of illuminants and lubricants as well as of explosive fuel, and thus to associate petroleum with the idea of peace.

In world commerce equality of opportunity would seem to be the highest international ideal to which fair competition forms the practical approach. Monopoly either of resources or of markets or of transportation must all be set down as belonging to the old order of economic thought rather than to the new, and instead we may insist upon the open door to sources of raw material and to markets for products and encourage rivalry in the efficient operation of merchantmen on the high seas. The first essential to a successful merchant marine, however, is access to the best fuel. I remember the remark of Captain Matson ten years ago that on the Pacific "fuel oil makes the difference between profit and loss."

How to supply the world's needs in oil thus comes to be an international question of the first order.

Consumption Exceeds Production

The monthly consumption of crude petroleum in the United States and the exports of refinery products, taken together, have but once in the last two years been less than our domestic production and for about half of the time the consumption has exceeded both the domestic production and the imports. This living beyond our means makes the question of our present oil supply not only a national but an international problem. And the outlook is not improving; indeed, never was the gap between consumption and production wider than it is now. Our monthly statistics take on the importance of danger signals, which must be read "Run slow." Perhaps these figures can be best grasped if they are stated in terms of a daily balance sheet. In September of this year, as in August, the daily output of the United States oil wells was slightly over 1,250,000 bbl., but the daily consumption rose to 1⅝ million barrels. This daily deficit of three-eights of a million barrels was met by imports from Mexico. To this extent, then, we are already dependent upon a foreign supply of oil, and even our accumulated stocks of domestic oil at tank farms, although a reminder of the days of plenty, afford too small a promise of relief, for the oil really available in storage is less than that which will be imported from

Mexico this year. Although reputed to be the nation richest in oil, the United States cannot stand alone.

In meeting the world's need for oil the United States has played a large part. In the last sixty years our contribution to the world's output of oil has been never less than 44 per cent (the figure during the brief period when Russia led) and earlier reached even 99 per cent, while of the total 8,000,000,000 bbl. so far consumed by the world war 5,000,000,000 have come from the wells of the United States.

The standing of this nation as the world's leading oil merchant has been based upon its plentiful supply of the raw material, to which have been added skill and ingenuity and courage at every step of oil production, oil manufacture, and oil finance. American methods and equipment and supplies have found worldwide acceptance, and the standing of the American industry is indicated by the fact that a dozen of our oil companies can show aggregate assets of over $3,000,000,000. However, the past and even the present division of the world's oil output between nations is but the background for our vision of the future. Whence must we expect the world's supply of oil?

U. S. Fields 40 Per Cent Exhausted

With the oil fields of the United States perhaps 40 per cent exhausted, it is not reasonable to assume that 60 per cent of the world's output will continue to come from wells in the United States. It is true that no other primary industry has shown anything like the growth of our oil industry, and even now the dangerous rate of increase continues; for the normal output of most commodities we can take the year 1913 as an index, but our output of petroleum in 1920 promises to exceed that of 1913 by nearly 75 per cent, and we may add that our output of gasoline has shown almost an equal increase in half that time. We who have watched this marvelous growth of the oil industry have seen within a few years the transition from oversupply to overdemand, and the ever-mounting curve of consumption seems to know no law.

To anyone who is disposed to question the accuracy of the geologist's estimates of oil reserves I willingly admit that these estimates may be too low by 50 per cent or even more, but I in turn put this question: Who could have foretold within 100 per cent of the truth the increase in the consumption of gasoline even during the present decade? As applied to the future of oil the law of supply and demand contains so many provisos that the nations of the world cannot view the situation with much complacency. Nearly a year ago I expressed my conviction that the United States Government cannot adopt as its oil policy the motto borne on its gold and silver coins, and the history of the last ten months, with consumption distancing production, has only emphasized the need of considerable human endeavor in providing our future oil supply.

Would Pool World Supply

Our present knowledge of the facts of world supply and demand is amply sufficient to warrant us in continuing to advocate the open-door policy. Much can be gained for all nations by pooling the world's resources of so essential a raw material as petroleum. With about 60 per cent of the world's future supply concentrated in two regions while by far the greater part of the demand arises outside those oil-rich regions, there must be a world commerce in oil. The United States has given to all comers, whatever their nationality, opportunity to acquire oil lands within its territory, and the new leasing law puts no limit upon foreign participation in operating the public oil lands unless there is an absence of reciprocal treatment. Of course, any nation realizes that the adoption of the open-door policy need not involve throwing away the key.

Not only has the United States been generous in welcoming foreign capital to our domestic oil fields, but it has been prodigal in marketing the products of the American wells and refineries. Whatever our motive has been in winning so large a share of the world's oil trade, the record of the past fully justifies the United States in asking for reciprocity in the future from all other nations.

By taking the world view we realize that international trade rests upon the unequal distribution of raw materials among the nations, as well as on differences in their industrial productivity and consumptive needs. Commerce between two nations, like an exchange of products between two men, can benefit both participants if commerce is not carried on as a war. The nation that is weak in resources may be tempted to think in terms of unfair trade practices, but the richer and stronger nations can surely afford to be idealistic in planning their industrial and commercial policies. Unfair tactics in interstate business are now forbidden by our laws, and Federal commissions enforce the laws, and it seems to me that the most important function of great organizations like the American Iron and Steel Institute and the American Petroleum Institute is to enforce among their constituent corporations this rule of "live and let live." That kind of regard of the stronger for the rights of the weaker makes for industrial peace and health. It is now recognized as good business to promote fair competition between merchants or manufacturers here at home; it should also be good business to carry the same spirit into world trade.

There is urgent need of pioneering the world for oil to meet the needs of this generation, but there is no warrant for regarding this advance into new fields as beginning a contest whose aim is world conquest. The present need of the United States for oil from abroad can be met only by world-wide exploration, development and operation by American companies backed up by our Government; and we should expect other nations that are embarrassed by a similar or even greater discrepancy between consumption and production to adopt the same policy.

Advocates Wide Search for Oil

The natural trend of a far-flung search for oil must be toward the frontier countries of the world which have not yet been able to develop their own resources; and this introduces new international relationships. On this subject of national rights I may quote from a letter of the Secretary of the Interior addressed last June to a Senate committee, to the effect that in any legislation intended to strengthen the position of American oil companies in foreign exploration there should be full recogni-

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American Gas Engineering Journal

SIXTY-FIRST YEAR

Published Weekly by AMERICAN GAS LIGHT JOURNAL, INC., 150 Nassau Street, New York, N. Y.

ELBERT P. CALLENDER, Pres. S. G. KRAKE, Vice-Pres.-Treas. A. M. GLEASON, Sec'y

Subscription $3.00 per year, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines; in Canada, $4.00; foreign, $5.00—Single Copies, 10 cents

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As the Journal Views It

Coal Regulation Wrong

The announcement made by Senator William M. Calder, that at the coming session of the Senate he will introduce a bill providing for Federal control of coal, has caused mingled expressions among gas men. Senator Calder has headed a committee investigating the coal situation. He declares that he has found evidence of profiteering.

We have no doubt but that the findings of Senator Calder are correct; but the AMERICAN GAS ENGINEERING JOURNAL is opposed to Federal regulation of coal. During the war we had Federal regulation of many commodities, but we believe it is generally agreed that this regulation was a failure.

The situation in the coal industry was caused by the panic of many people who, in attempting to assure themselves of a supply, went into the open market, with the result that there was a shortage. Now that war-time conditions are gradually righting themselves, it follows that the coal situation also will right itself.

While it is true that gas companies in the past have had to go into the open market and purchase coal, it is likewise true that the companies are making arrangements with their dealers to care for their wants in the future. The question of price, provided it is not raised above its present mark, does not enter into the situation, because the rate increases granted to the various companies, and which appear to be general, have been on the basis of expensive coal. The gas industry has been a victim of one-sided control for a long period, and it knows just what hardship this works. The AMERICAN GAS ENGINEERING JOURNAL is against this form of regulation.

Educating the Public

The unfortunate situation existing from coast to coast between the gas companies and the consumers generally must be corrected, and it is within the power of the individual companies to correct it.

Let's call a spade a spade, and admit that the consumers are antagonistic because they believe the companies are trying to overcharge for their product. If the companies were trying to overcharge, the consumers would have a legitimate complaint. Therefore, let the companies which know they are right begin at once to sell their proposition on its merits.

Here is the way: Tell the consumers, by word of mouth and by printed forms, just what difficulties the companies must overcome.

Without being too technical, tell them about the desired and needed change in the B.t.u. standards. Tell them how the lack of coal and the scarcity of gas oil makes the product at once more expensive and yet of poorer quality. Don't keep your business a secret. Let the consumer know something about the process of manufacture. Let him see your plant in operation.

The consumer is human, but his point of view is different from yours. But the consumer is fair. Just show him and he will pull with you.

There is no reason why the companies should not start on this program of educational propaganda at once. It will win, and it will end senseless opposition and will help to solidify one of the most important of all public utilities.

Spread Message of Convention

One of the pleasant after-effects of the convention of the American Gas Association is just being registered. According to reports which have reached New York, the message of the convention has been carried back to the various companies throughout the United States and meetings of employees have been held at which speeches were made reporting the success of the convention.

This development was not unlooked for, but it shows the impression created by the convention is going to be lasting, and it also is an indication of the widespread power that this association is gaining.

The American Gas Association has done a splendid work in the past, but with this kind of co-operation there is no limit to its possibilities. It is only by every member doing his best that the association can attain its full growth. The plans for the ensuing year are most pretentious, but there is no reason why these plans should not be carried out to the full if every member will do his part.

Popular Ownership of Companies

Popular ownership of gas companies, and by this is meant ownership of the securities of the companies by their consumers, seems to be becoming more and more widespread. This is a step in the right direction, and it will do a great deal toward solving some of the problems of regulation that have been confronting the public utility field.

Popular ownership of companies is undoubtedly the best way of fighting municipal ownership, for there is no power great enough to fight against an aroused public which feels that its rights are being taken away from it by unfair regulation.

During the past few weeks word has reached the AMERICAN GAS ENGINEERING JOURNAL of companies which are starting campaigns to interest their consumers in purchasing securities in the companies. In most cases these securities are sold on the instalment plan, so that even the least of those on the books of the company may participate in the ownership of the company and their interest in its welfare thus assured.

When once this movement has become general, one of the greatest sources of trouble for the companies will have been removed and there will be a more general understanding of some of the problems that we are confronted by.

A peculiar angle of the situation is the wholehearted backing that this plan receives from the big financial interests. Leaders in the world of Wall Street take the attitude that the sale of securities to consumers means that a new investor has been created and that it will be much easier to interest this investor in other good securities.

This popular sale is also going to solve the problem of where to find money with which to finance extensions and improvements to the property. During the past few months Wall Street interests have not been able to handle the securities of gas companies at any where near their normal value, while the stocks are worth par to the average consumer. Incidentally, this method is one of the best that has been devised for educating the consumer.

U. S. Scientists Seek Method to Control Sulphur in Gas

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retort coal gas and vertical retort gas. Carbon bisulphide is always found in much larger quantities in horizontal retort gas where the gas must pass through a highly heated zone than in vertical retort gas where the upper part of the retort is comparatively cool.

One of the most important secondary reactions occurring in the gas retort is that between hydrogen and the sulphur of the coke. Extended experiments have brought out the fact that a rapid flow of hydrogen through red-hot coke will remove the sulphur in the form of hydrogen sulphide. The rate of reaction be-

tween the coke sulphur and the hydrogen seems to be fairly rapid but equilibrium is reached at rather a low concentration of hydrogen, so that a fairly large concentration of hydrogen is necessary to make an appreciable decrease in the coke sulphur.

A study of this reaction as applied to several coals has been made using the laboratory coking apparatus described earlier in this paper. Hydrogen was passed through the tube at a rapid rate for about three hours. The comparative effect of this treatment as affecting the distribution of the sulphur is shown in the following table:

TABLE III—DISTRIBUTION OF SULPHUR WITH AND WITHOUT HYDROGEN—UPPER FREEPORT COAL No. 23066

Values Given in Per Cent of Original Air-Dried Coal

		Without Hydrogen		With Hydrogen	
	Coal	500 Deg. Cent.	1,000 Deg. Cent.	500 Deg. Cent.	1,000 Deg. Cent.
Pyritic sulphur.....	0.47	0.33	0.00	0.01	0.00
Sulphate sulphur...	0.07	0.01	0.00	0.01	0.00
Organic sulphur....	0.67	0.58	0.66	0.63	0.07
Sulphide sulphur...	0.00	0.09	0.12	0.17	0.00
Sulphur as H_2S....	0.00	0.17	0.40	0.36	1.11
Tar sulphur	0.00	0.03	0.03	0.03	0.03
Total sulphur....	1.21	1.21	1.21	1.21	1.21

A study of this table shows that two important changes were caused by the passage of the hydrogen. In the first place the pyrite was caused to decompose at a lower temperature. This would not affect the final results, however, since pyrite would be completely decomposed at 1,000 deg. Cent. anyway.

By far the most important effect of the hydrogen, however, was the great increase in the amount of sulphur evolved as hydrogen sulphide and the consequent decrease in the sulphur of the coke. In this particular case the sulphur content of the coke was decreased 90 per cent by the passage of hydrogen through it.

This action of the hydrogen on the sulphur in red-hot coke brings up the very practical question as to the effect coal gas and particularly the high hydrogen coal gas of the final distillation stage, might have on making the sulphur in the gas higher than that indicated by the primary carbonization reactions.

Coal gas containing 50 per cent hydrogen was passed through coal in the process of carbonization at a fairly rapid rate. This coal when subjected to ordinary destructive distillation evolved 0.40 per cent of its weight as hydrogen sulphide. When hydrogen was passed through 1.11 per cent of its weight in hydrogen sulphide was evolved, while the 50 per cent hydrogen mixture caused 0.86 per cent of hydrogen sulphide to be eliminated. Gaseous mixtures containing hydrogen therefore remove sulphur from red-hot coke, although to a lesser extent than pure hydrogen.

This secondary reaction between the sulphur of the coke and the gas traveling through it readily explains why the lean gas from the later stages of the carbonization contains any sulphur at all. According to the primary reactions practically no sulphur is evolved after the charge has reached a temperature of 600 deg. Cent., although a large quantity of gas, high in hydrogen, passes off after the temperature has been attained. This gas, free of sulphur at first, picks up sulphur almost to the saturation point of the gas, as it travels through the hot coke mass. Although the sulphur in the lean gas is very much less than that in the gas from the earlier stages of carbonization, it will often run around 50 gr. of hydrogen sulphide per 100 cu. ft., which is much more than would be obtained from the primary reactions alone.

In a set of experiments run at the experimental gas plant of Johns Hopkins University by the United Gas Improvement Company, the Johns Hopkins University, and the Bureau of Mines, a study was made of the sulphur of the coke from different parts of the retort. The retort was of the ordinary D section, and samples of coke were taken from the bottom, the center, and the top of the finished coke mass. The highest sulphur percentage was found at the bottom, which was to be expected, since no passage of gas would occur through this portion of the charge, and the sulphur retained in the coke would just correspond to the primary reactions. The lowest sulphur content was found in the center. This portion would stay cool, while the high sulphur gases were passing through, so would not absorb any sulphur. By the time the center was hot, the gases passing through this portion would be high in hydrogen and just in the rigid condition for taking out sulphur from the coke. This explains the low sulphur content of the center. The top was lower in sulphur than the bottom, due to some cleansing action of the gases passing through the charge, but was higher than the center. This was due to two reasons—first, that the top was hot when the early high sulphur gas was passing through, probably causing some absorption of sulphur and second, that when the high hydrogen gas did start to pass through it had already absorbed some sulphur from lower portions of the charge and therefore did not have a very high absorptive capacity. This test brought out the secondary action of coal gas in the retort very clearly.

A rather detailed study has been made of this action of the gas as it passes through the by-product oven. Analyses for sulphur in the coke from different portions of the oven have brought out the fact that no decided variation occurs from place to place. This must be due to the slow rate of heating in the by-product oven and the consequent diffusion of the gas to every portion. Just at the point where the gas passes up through the standpipe, however, the sulphur in the coke is quite noticeably lower, due undoubtedly to the fact that at this point there is a definite current of gas passing through the coke. Nor is this due to the deposition of tar, as some have claimed, for the ash content of the coke from this part of the oven is as high as that from any other part.

The effect of passing by-product gas back through the oven for the purpose of decreasing the sulphur in the coke has been tried with very interesting results. By passing purified gas through the oven at a fairly good rate and for a good many hours, 15 per cent desulphurization of the coke has been secured. Unpurified gas, however, seemed to increase the sulphur in the coke slightly. All of these practical tests have been cited to prove the existence of this secondary reaction between the sulphur of the coke and the gas.

Even after the gas leaves the retort many changes in its sulphur content occur. Most important among these is the removal of a portion of the sulphur by the ammonia liquor. This decrease in the sulphur content of

gas between the retort and the purifiers is well under stood by gas men and need not be entered into here in detail.

Conclusions

Sulphur occurs in coal in the form of iron pyrites, organic sulphur and small amounts of sulphates.

When the coal is heated in the gas retort or the by-product oven, the following changes in the sulphur of the coal occur:

(*a*) The iron pyrite decomposes, one-half of the pyritic sulphur remaining in the coke in the form of ferrous sulphide, and the other half passing off in the gas in the form of hydrogen sulphide.

(*b*) A portion of the organic sulphur is evolved in the gas as hydrogen sulphide, a small part goes into the tar, while the remainder, which is generally the majority of the organic sulphur, is fixed in the coke as a very stable carbon-sulphur combination, which may be chemical or physical.

(*c*) Any sulphate present is reduced to sulphide and remains in the coke.

Secondary reactions which occur as the gas passes through the hot coke bed are very important in determining the sulphur content of the gas.

(*a*) Carbon bisulphide is formed by the action of hydrogen sulphide on the red-hot coke, and is highest where longest contact of the gas with the hot coke mass is prevalent.

(*b*) The hydrogen of the gas takes sulphur from the hot coke as hydrogen sulphide until a certain saturation limit is reached. This secondary reaction causes the hydrogen sulphide content of the gas to be somewhat higher than the primary reactions would call for.

Acknowledgments

The author wishes to express his thanks for advice and assistance during the investigations summarized in this paper to A. C. Fieldner, supervising chemist, and J. D. Davis, fuel chemist, Pittsburgh experiment station, Bureau of Mines.

Will Recommend Federal Regulation of Coal Industry as Only Solution of Vital Problem of Supply

(*Continued from page* 466.)

that prices began to skyrocket. This was the opinion of an operator of a score of public utilities in different parts of the United States. He added that domestic users of coal had undoubtedly been victims of the greed of some retailers, but this could be taken care of by the laws already in effect. But to stultify the coal industry with regulations would result in creating a situation that would cause great hardship not only to gas companies but likewise to all users.

Coal Men Oppose Regulation

It is interesting to note that coal operators are almost a unit in opposing regulation. They take the position that they are victims of a situation that is not of their making but has been forced on them. If there has been profiteering, they state, they, as a general rule, have been ignorant of it, but they are willing to co-operate in any movement that will eliminate this evil.

Taking the question as it affects the gas industry, it is one of the most important that has arisen in a long time and it would be interesting and serve as a guide if executives would accept the invitation of the American Gas Engineering Journal and express their opinions in its columns. The American Gas Engineering Journal is prepared to help fight for that which will best serve the needs of the industry, but to do this intelligently it needs the expressions of the various gas companies as to their opinions. This is th etime to act.

Future Interest of World Demand Present Realization of Oil Problem, Declares U. S. Authority

(*Continued from page* 472.)

tion of national rights, and no language should be used that could be misunderstood and made the occasion of any anti-American feeling. "Our Government," said Secretary Payne, "would surely recognize the preferential right of another nation to the products of its own territory in time of need and under conditions of equitable compensation to our nationals, whatever their possessory rights."

However great our own exigencies, then, we may set down this principle: the rights of the company that discovers and develops a foreign oil supply are subject to national rights and even a mandatory is created to develop the weaker nation, not to exploit it. If the nations of the world shall join to bring about a changed order, one that expresses the spirit of peace rather than of war, there can be no place in the international scheme for special partners or preferred stock, even though the Argonauts of to-day, in their search for a flood of oil, are seeking a treasure of far greater value than any golden fleece.

The first thought in either a national or a world program for oil is to stimulate production; "more oil needed" describes the symptom felt by every nation, and new and larger supplies of oil is the remedy sought. Taking the long view as well as the broad view, however, we are forced to admit the equal need of checking consumption. A world policy, if it is to safeguard the future, must be drawn up on a program that will favor thrift in the use of the oil currently produced, and in that program also there must be a joining of the nations in continued effort for the common good. When the world runs short of oil all nations will suffer, regardless of the geographic location of the remaining wells. America has led in teaching the world to use petroleum, whether in lamp or automobile or tractor, and it should be America's special duty to teach the world to use petroleum most efficiently. No longer is there any need to make a market for oil; the task is to find the oil to supply the demand already created.

Plainly, the common interest in a limited resource is not served simply by regulation in price. It is of greater consequence to the public, either the people of a single nation or humanity as a whole, that the best use rather than the freest use be made of an invaluable resource. The danger that lies in cheapness is the wastefulness of to-day that will lead to the consequent scarcity and corresponding high

(*Continued on page* 14, *Advertising Section.*)

Proper Cost Distribution Turns Losses to Gains in Merchandise Department

John J. Flautt Describes How New Orleans Company Installed System which Bared Astonishing Laxities in Records

Often when thinking of profits on merchandise and jobbing it brings me back to those former days of what we thought were profits and in reality it was a big loss. I attribute this to lack of proper cost-keeping records, and some changes needed in our accounting system, declared John J. Flautt in a paper presented at the annual convention of the South Central Gas Association.

About four years ago, we interested ourselves in the merchandise and jobbing department in trying to make it a self-sustaining department. This is when we discovered the first thing we needed, which was a good cost-keeping system and some changes in our accounting methods.

It was just prior to the installation of the above that we thought we were making profits, and instead, we were showing losses, for in the new system, it was there we discovered that all elements of cost had not been considered. The elements of cost which we now take into consideration and which we think covers every cost entering into an appliance, from the paying to the manufacturer for his cost, to installing it in our customer's residence are as follows:

Freight and drayage to storeroom.
Rent of storeroom, storeroom clerks and miscellaneous expense.
Laborers in storeroom to clean and polish appliances.
Garage expense (which includes rent, mechanics' time to maintain trucks, gasoline for operating, tires and depreciation).
Connecting cost (which takes in the expense of the fitter and helper and material used.

Here is one of the vital points to consider: For instance, you give the fitter and helper three ranges to install in one day. Don't figure only the cost of time used in installing a range in the premises, but spread the day's pay to the fitter and helper over the three ranges, as that is all the work they have done for the day, and also figure some waste in material as the fitter usually leaves a few feet of pipe on the premises and gives away or loses a few couplings.

Sales Expense

Under this heading you have sales manager's salary, salaries of floor salesmen, and commission of outside salesmen, demonstration, advertising, rent for salesroom floor and sales manager's office, office supplies and expense of printing, stationery and insurance.

Auditing Department Expense

Under this heading you have a part of the auditor's salary, and whatever proportion of the office force's time is consumed on appliances. This also applies in connection with rent, office supplies and expense, and printing and stationery.

Treasury Department Expense

Under this heading you have a part of the treasurer's salary and the proportion of office force's time consumed on appliances, rent, office supplies and expense, printing and stationery. You also have uncollectable bills, legal expense and cost of removing appliances not paid for.

Administration Expense

Under this heading comes a portion of the salaries and expense in the general manager's department.

If every gas company sales department manager would take in all of the foregoing costs, there is no doubt in my mind but that he would find himself "breaking even" at the end of the year.

The only reason why any company is not breaking even in its merchandise and jobbing department today is because as has been said before, they have not gotten down to figures with themselves, and found out just exactly what the two words "cost" and "profit" mean. For cost is not just what you pay for anything you buy and sell: it is what you spend to buy and sell it.

There are three ways to overcome a loss in the merchandise and jobbing department:

First—Build up gross sales.
Second—Reduce the operating expense.
Third—Raise prices.

Of the three ways mentioned above, there seems to be only two ways at the present time; that is, either to build up gross sales or raise prices. The question of trying to reduce operating expense is an impossibility at this time. This is an opportune time to get your price for appliances so as to break even, as everyone is being paid a fairly good wage or salary.

Cost of Installation as Much as Appliance Itself

It has been recommended to discontinue if possible the connecting of all appliances as that is one of the principal factors that enter into the cost. For instance, it has been my experience that the cost to install a tank water heater is as much as the heater itself. This, of course, is brought about due to the present increased cost of labor and material.

Again to the above factors are the reasons why it is easier for the electric departments to show a profit in its merchandise and jobbing account as compared with that of a gas company. Electric appliances are mostly sold over the counter, paid for, wrapped up and carried home, all of which are clean and free from installation costs.

Window Displays That Result in More Heater Sales

By Ernest A. Dench

The Kansas City Gas Company, Kansas City, Mo., arranged a gas grate display that can be used in connection with other types of gas heaters. The window showed a new style gas grate, which was set in the wall in the background, as in a living room. Stationed at each rear side was a tall palm, while balancing the two palms in the center rear was a gray wall, the tall end posts of which were topped by pots of flowers. The window was filled down in front with two semi-circles formed with grates. The grates behind these semi-circles were exhibited on gray painted stands of varying heights, the middle grate being highest and diminishing toward each end. Occupying each front corner was a small rubber plant.

No More Bathing at the Beach

The Lansing (Mich.) Gas & Fuel Company were responsible for a novel gas water heater window display. The floor was liberally sprinkled with sand to represent an ocean beach. A notice placed at the rear announced:

"Bathing Season Closed at the Beach"

The beach was occupied by a recumbent wax figure, shielded with a large purple and yellow umbrella. The only part of her form that the umbrella revealed were the red silk hose shod feet and ankles. There was a card down in front that stated:

"We Should Worry—We can have all the bathing we want at home."

The glimpse of a pretty ankle is always good for a crown, but this stunt was an ideal combination of the spectacular and commercial elements.

Proof of Warmth

The Cahn-Foster Electric Company, Denver, Col., furnished their electric heater show window like a living room. The middle was occupied by an electric heater, its heat-giving rays reflected by the copper protector giving the right suggestion of coziness. In front of the heater was a life-size cut-out of a little boy of about four years of age. The boy was entirely naked except for a large genuine bath towel that was thrown over his shoulder. The card backing up the exhibit was as follows:

"I'm warm; are you?"

Snow Man on the Job

Power's, Portland, Ore., conceived a very wintry setting for their window display of heaters. The ceiling was hung with sparkling icicles. Jutting out at each rear side, and continuing into the painted background, was a white fence. On the background was painted a road running into the distance. There were two wheel marks along the snowy road, while in the distance could be observed a little cluster of houses, church and other buildings, with a few evergreen trees covered with snow. In front of the painted background was the cut-out of a very fat snow man. A hat was on his head, a pipe in his mouth, and he held a broom in one of his arms. To the right of the snow man was a cut-out of a jolly-looking old man, with a goatee beard, red muffler, big basket on his arm and holding an awkward-looking umbrella. He stood laughing at the snow man. To the left and behind the snow man was a cut-out of a small boy, who peeped out and ridiculed the snow man. In front of the snow man was a cute little dog cut-out, placed in the attitude of looking up at the snow man. Over the sprakling white floor down in front were various kinds of heaters, with two heavy black andirons by the window glass at the middle. A card placed in between the two andirons offered:

"Any heater in the store for one dollar per week."

Well-Balanced Trim

The Danbury (Conn.) Hardware Store placed an electric hearth-style heater in the middle of their show window. The heater was lighted exactly as in use, with a screen around it and a fire set in front. At the left was a galvanized coal scuttle, with a galvanized pail at the right side. Placed to the rear of the electric heater was a coal heater, with a galvanized ash can and sifter at each side of it. In front of the electric heater was a pair of andirons, matched at each front side by an oil heater.

Heater Sale Slogan

Last winter Gimbels, New York City, conducted a sale of heaters, in connection with which the window cards and newspaper announcements were sloganized in the following effective manner:

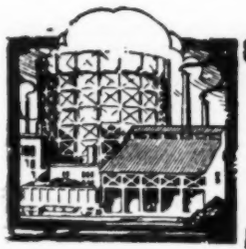
"Keeping warm is keeping well."

The Heater Collection

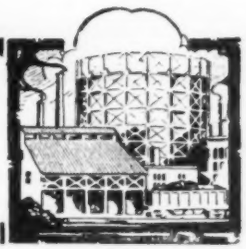
The American Hardware Stores, Bridgeport, Conn., assembled a dandy collection of heaters in their window. The center rear was occupied by a table covered with cream crepe fluted paper. Reposing in the middle of the table was an electric heater of the open-hearth type, with an electric fan on top of the same. At each side of the heater was a blue enameled oil stove. At the far right and left rear corners were small stands, each holding an electric heater with an electric fan on top. Between the middle table and the two end stands, but nearer the front, was a small table at each side holding a black oil stove. In front of the middle table was a pair of andirons with large owl heads, while the fire set of shovels and tongs between at the back rested against the table. In front of the andiron exhibit were three black oil stoves with an electric fan in between each one. The color effects in this display resulted from the brass of the fans, the copper color of the electric heaters, and the black and blue of the oil stoves.

The Winter Furnace Setting

Meeker's, Danbury, Conn., arranged a furnace display that was floored with white crepe paper, with small bunches of cotton batting scattered all over it. At the middle was a small cardboard section of a house that revealed the interiors of four very comfortably furnished rooms. The roof of the house was covered with snow, resulting in a very realistic winter scene.



NEWS OF THE GAS INDUSTRY



Providence Gas Company to Aid Employees to Become Stockholders

The Providence (R. I.) Gas Company, of which C. H. Manchester is president, is planning to aid all its employees to become stockholders in the company. The following statement explains the plan in full:

Any person who, on December 1, 1920, shall have been continuously in the service of the Providence Gas Company one year or more may subscribe for one share of stock at par, $50 per share, for each full $200 of his annual wages as of that date, but for not exceeding fifteen shares in any instance. If, at the close of business on Dec. 1, 1920, any of the stock set aside for the purpose of carrying this plan into effect shall remain unsubscribed for, it shall be used for filling subscriptions, on the aforesaid terms and conditions, from employees who, on Dec. 1, 1920, shall have been continuously in the service of the company six months or more. All subscriptions hereunder, must be filed with the treasurer on or before Dec. 1, 1920.

Payments for the stock at the rate of 50 cents per share per week, beginning Jan. 1, 1921, will be deducted from the employee's wages until the stock is paid for. After Jan. 1, 1922, the stock may be paid for in full, if so desired. Certificates will be delivered only when the stock has been fully paid for, and in no event before Jan. 1, 1922.

Dividends on the stock partially paid for will be credited as payments on account of the subscription price. No interest will be charged on that part of the purchase price remaining unpaid, nor will any interest be credited on instalments of the purchase price.

All rights to subscribe for new stock, bonds, or debentures, accruing to stock subscribed for but only partially paid for, shall be sold at market value, and the proceeds thereof credited as payments on account of the subscription price.

As each share is fully paid for it will, upon approval by the trustees, be transferred to the subscriber, but no such transfer will be made prior to Jan. 1, 1922. Stock so transferred has all the incidents of other stock outstanding.

In case an employee leaves the service of the Company before his stock is fully paid for, his purchase agreement shall be canceled and the net amount paid in and credited on account of the purchase price will be paid to him.

Any employee whose name is temporarily taken off the regular payroll by reason of leave of absence, disability or other reason, may, at his option and with the consent of the trustees:

(*a*) Cancel his purchase agreement and receive amount to which he would be entitled if permanently leaving the service; or

(*b*) Continue to make his regular payments to the trustees. In case an employee elects this option (*b*) and fails to make payments called for by his purchase agreement, said agreement will be canceled and he will receive the amount to which he would be entitled if leaving the service permanently.

If an employee dies before his stock is fully paid for, his purchase agreement shall be canceled and the amount standing to his credit on his account shall be paid to his legal representatives.

If, for any reason other than leaving the service, or temporary absence, any employee desires to withdraw from his purchase agreement, he may file application to that effect, stating his reasons; if the application is approved by the trustees, the amount standing to his credit on his account shall be repaid to him and his purchase agreement canceled. In unusual circumstances a subscriber may be permitted, in the discretion of the trustees, to withdraw from his purchase agreement in part, in which event an equitable adjustment of his account will be made.

One dollar per share per year will be paid to subscribers who remain in the company's employ and retain their stock. This bonus will be due on January 1 of each year, for a period of five years, beginning Jan. 1, 1922. In case of partially paid stock the payment will be credited on account of the subscription price, and in case of fully paid stock it will be paid to the subscriber during the first week in January during said period, upon presentation of the stock certificate.

Boston Consolidated Asks for New Rate Increase

The Boston (Mass.) Consolidated Gas Company has petitioned the Department of Public Utilities for permission to increase its price for gas sold to its consumers. The company does not ask for any specific increase, but rather to be allowed to raise its rate "to such extent as may justly be required by reason of increases in the price of labor and materials and other changes in conditions increasing the general cost of manufacture and distribution of gas."

The Department of Public Utilities has not fixed a date to hear the petition. The present price is $1.35 per 1,000 cu. ft., the last increase having been authorized last July, when the price was raised from $1.10.

At that time the increase to $1.35 was granted by the department temporarily only. The city of Boston opposed the increase but was not ready with a report to be made by experts who were making a comprehensive study of the situation. Arthur D. Hill, corporation counsel for the city, at the hearings, told the commission that the investigation would be completed early in September and a report of the findings submitted to the commission. This report has not yet reached the commission.

The new petition does not affect the subsidiaries of the company, the Newton & Watertown Gas Company, the East Boston Gas Company and the Citizens' Gas Light Company of Quincy. At the time of its last increase the company asked and was given permission to increase its rates

to these subsidiary companies. The subsidiary companies at the same time asked to be allowed to increase their rates to their consumers to amounts equal to, or greater than, the boosts allowed in the wholesale rates charged to them by the mother company. The department allowed these companies, also, to increase their consumer rates.

Soft Coal Prices Drop 25 Per Cent

With the average output of soft coal now running 12,000,000 tons or more a week, prices have declined more than 25 per cent in many of the fields during the last month, according to announcement by the National Coal Association.

Operators in soft coal fields where unusually high prices existed have, within ten days, it is stated, been setting up fair practice committees, and working in conjunction with Attorney General Palmer.

The soft-coal requirements of the entire nation already have been met, except in a few isolated communities, and storage of coal for winter uses in many parts of the country has begun, says the statement.

Colonel D. B. Wentz, president of the National Coal Association, in a statement denounced as false the assertion by Franklin T. Miller, in New York, that the bituminous coal operators had persuaded Joseph P. Tumulty, Secretary to the President, to influence the Interstate Commerce Commission to issue priority orders so that operators could "dodge" contracts at lower prices than those prevailing in the open market during the coal shortage. He said:

"The operators through their officers kept Mr. Tumulty informed as to developments in the effort to overcome the serious coal shortage. That is all they sought to do and all that was done."

Louisville Opposes New Gas Rate Increase

A controversy over gas rates is on between the Louisville Gas & Electric Company on the one side and the city officials and various civic clubs on the other. It grew out of a gas shortage which resulted after the first cold snap of the winter. The company wanted to increase the gas rates 10 cents a thousand to users of more than 5,000 ft. per month, the scale of increase being graded up to 90 cents per thousand for users of more than 100,000 ft. per month. This was made necessary, the company pointed out, because of the added cost of producing artificial gas to supplement the supply of natural gas and thus overcome the shortage.

The civic clubs and various individuals protested to the city officials demanding that artificial gas be furnished at the same price as natural gas In other words, they did not want to have any increase, whatever. City officials maintained a somewhat neutral attitude. A compromise was effected Nov. 19, whereby a reduction of practically 50 per cent was made in the increased rates requested by the company. The schedule of increases was announced as follows, although minor changes may be made before an ordinance is brought up in the city council putting the new rates into effect:

5,000 ft. or less per month, no extra charge.
5000 to 15,000 ft. per month, 5 cents per thousand.
15,000 to 30,000 ft. per month, 10 cents per thousand.
50,000 to 100,000 ft. per month, 35 cents per thousand.
Exceeding 100,000 ft. per month, 45 cents per thousand.

Included in the report of the gas company to city officials were the following facts: The company has completed a 30-mile pipe line from its main line to the Pennegrade gas field in Floyd County, Ky. It has drilled wells, with an open flow of 6,000,000 cu. ft. per day, which means 2,000,000 ft. per day available. Nov. 19, for the first time, gas from the Pennegrade field was pumped to Louisville.

In addition, the company is now drilling four more wells, which are expected to have an open flow of 7,000,000 cu. ft. per day, of which about 2,500,000 ft. will be available, it being impossible to conduct more than that quantity from an "open" flow of 7,000,000 through a pipe line. These four wells are expected to be ready for operation in January. A compressor has been completed on a seven-mile line built to the gas field in Johnson County, which is yielding about 3,500,000 ft. per day. Another compressor is completed at Winchester, Ky.

The company hopes that the 11,000,000 ft. of gas which it has been furnished by the West Virginia fields will continue to be supplied and that within a short time a total of 18,500,000 cu. ft. of natural gas will be available daily to Louisville. City officials and officers of the company say that this is sufficient to supply all the demands at a temperature of about 31 deg. With the addition of a maximum of 4,500,000 ft. of artificial gas there should be enough gas to take care of any cold weather demand. With the reserve tanks kept full even a decided drop in the temperature would not bring suffering to the gas consumers, if the cold spell does not extend over too long a period, it is believed. In severe emergency cases, city officials say, it might be possible to pump 20,000,000 cu. ft. of natural gas to Louisville when all wells are connected up, but they had been told that it is unwise to subject the pipe line to an extraordinary pressure for any considerable length of time, as the danger of breaks is too great.

Gas Company Earns 14.8 Per Cent in 1920

The earnings of the Fall River Gas Works Company, Fall River, Mass., showing surplus after charges in September were $7,388; for the twelve months ended Sept. 30 they were $166,877. This is 14.8 per cent on the $1,127,000 capital stock.

Gloucester Gas Co. Contracts for New Equipment to Provide for Increased Output

The Gloucester (Mass.) Light Company has awarded contract for a new eight-foot double superheater carbureted water gas set to the Gas Machinery Company, Cleveland, O.

This new water gas set will be located alongside of the present six-foot set in a space that has been provided in the same building and the gas company is going to install new blast apparatus which will go into a new machinery room adjoining the water gas sets.

The gas company will also install other new auxiliary apparatus so as to maintain the plant in first class condition for taking care of the rapidly increasing output and for continuing the high class of service that has been furnished in the past.

Priority List of Gas Patrons and Extensive Program of Improvements Features of Proposed Ordinance

Citizens Gas Company of Indianapolis Warns Patrons of Gas Shortage Unless B.t.u. Standard is Reduced

Many developments are occurring in the situation revolving about the Citizens Gas Company, of Indianapolis, which has for years been the object of attention throughout the gas world because of its adaptation of the by-product system in such a manner that 55-cent and 60-cent gas for domestic use has been possible, even during the war period.

The war brought home to public officials, gas company officials and patrons of gas companies in Indiana very clearly the fact that a readjustment of heat content in the State gas standard must be accomplished, under the trying coal situation, if patrons all over the State were not to suffer during winter months at least. This realization resulted in long investigation and negotiations in Indiana, which THE JOURNAL has set out from time to time.

Gradually the big Citizens Gas Company at Indianapolis has found itself unable to cope with the fuel situation and many efforts have been made this fall to arrive at some basis whereby patrons of the company would not suffer if gas shortage became inevitable. Hearings before the Public Service Commission in the matter eventually evolved into a long discussion between the gas company and the city of Indianapolis and a special committee of the city council now has before it for action a proposed ordinance, which ratifies an agreement entered into by all the parties concerned.

The proposed ordinance would create a priority list of gas patrons for use in emergencies that may confront the gas company. An early meeting of the city council probably will pass on the subject, and indications are that if the report of the special committee, headed by Councilman Russell G. Willson, is favorable to the ordinance, the city will adopt it and place it in effect.

Perhaps the most interesting discussion that has occurred in the gas world in Indiana in years now is in progress concerning the situation. It has become apparent that some reduction in the B.t.u. standard—over which question much controversy has arisen—from the 600 standard of former years, must come. Supporting this view, Harry O. Garman, chief engineer of the Public Service Commission of Indiana, recently addressed the Indianapolis city council. Mr. Garman was one of the active forces in the statewide investigation and discussion of the B.t.u. standard question, which held the attention of the utility public last year.

In his address to the Indianapolis council, Mr. Garman asserted that "Indianapolis had better hang on to her 60-cent gas as long as she can" and advised the city council to maintain the low rate even at the expense of "a little quality."

He further declared that Indianapolis has just about burned her last 600-B.t.u. gas.

"Gas in coal is getting less and less, owing to the poorer quality of the coal," he said, "and a 600 standard is almost impossible to obtain, especially in Indiana."

Mr. Garman also pointed out that gas with 570 units, delivered at a steady pressure, would be as satisfactory to the consumer as 600 gas delivered in spurts, as would be necessary if the present coal situation continued.

At this same meeting Councilman Willson objected to a clause in the then proposed ordinance which would put the users of heating appliances in the last class in the priority list suggested for emergencies. In some cases, he argued, this would work a hardship on gas users, and especially on those who were unable to obtain coal. He also suggested at that time the insertion of a clause stating that nothing in the ordinance be construed to allow the gas company to increase its 60-cent rate.

Samuel Ashby, corporation counsel for Indianapolis, at this meeting, took the stand that the original franchise granted by the city to the gas company made it impossible for the city legally to compel the company to make improvements. The proposed ordinance, ratifying the agreement, would work to allow the gas company officials to make $1,000,000 worth of improvements and extensions to the service at its plants before December 31, 1921, if the company were able to finance them.

"The original franchise granted the company prevents us (the council) from ordering the company to do things," Councilman Willson said after that meeting. "Dozens of people have come to me asking why the council does not compel the company to make improvements and prevent gas shortages. The reason we don't make them is that we have no legal authority to do so."

Out of all the controversy it is apparent that some sort of action will develop to relieve the situation that now surrounds the gas company, and thereby also relieve the people of Indianapolis from recurrent low gas pressure.

Discussing the agreement out of which it is expected a new city ordinance—in the form of an amendment—will grow, J. D. Forrest, general manager of the Citizens Gas Company, said:

"It is not proper that either the city council or the public should get the impression that the proposed ordinance approving the agreement between the Board of Public Works and the gas company is in any sense for the benefit of the gas company. It is solely for the benefit of the public and it was with that in view that the Board of Public Works took the matter up with us. The whole program was initiated by the Board of Public Works solely for the purpose of protecting the public against an exhaustion of the gas supply. In the discussions which have extended over several weeks there has never been any controversy between the Board of Public Works and the gas company. The time required in maturing this agreement was due solely to the importance of working out some details and getting the language as clear as possible. The Board of Public Works, like the Public Service Commission has fully realized that one of the primary necessities of the community is a reasonable supply of gas for cooking purposes, and that in times of shortage the supply for cooking should be maintained regardless of the inconvenience caused to certain consumers from a shortage for other purposes. Therefore, the measure provides a strict priority for cooking and other incidental domestic needs which cannot be met except by using gas. In the next place, both of these public bodies have recognized that the use of gas for industrial purposes is legitimate and is even essential to many of the city's most important industries

Therefore, if the condition of the supply permits, it is provided that the industrial consumers shall be supplied before gas is made available for other uses for which substitutes can readily be found. The chief of these other uses is heating. There have been some sentimental statements about the importance of supplying people with gas for heating when they have no other means of heating. As a matter of fact there are no such cases in the city of Indianapolis. There may be some who have not laid in coal or who have persisted after four years of inability on the part of the company to provide gas for heating purposes in depending upon it. The vital interests of the city should not be sacrificed because of this persistent disregard by a comparatively few persons of the great needs of the community.

"The measures proposed by the Board of Public Works simply authorize the company and make it its duty to take certain steps to safeguard the community against a disaster which would be great beyond description if the supply of gas should be totally exhausted. While the company has not asked for such safeguards, it cheerfully assumes the obligations imposed by this proposed agreement and will continue to do all in its power to prevent an exhaustion of the supply of gas. That is all there is to the regulations proposed in this ordinance.

"So far as the improvement program is concerned, this is not a new thing with the company. In all of its essential features it has been before us since the year 1916. We have given a detailed statement to the Board of Public Works setting forth this program, and it is proper to state that the estimated expenditure of $2,750,000 covers only those items which have to do with an increase in gas producing capacity and in the ability to get gas out of the plants. Nothing is included in this program for the annual main extensions which will cost about $100,000 per year, nor for numerous minor improvements which are important but which do not bear directly on the problem of increasing gas production. Neither is anything provided for the redemption of the short term bonds which mature on the first day of May in each of the three years covered by our improvement program. It is the purpose of the company to go forward with all of the improvements named as rapidly as they can be financed. Anyone who has watched the course of the money market during the past four years must realize that the financing of such a program is not easy. We made an effort to begin this work last March but found it impossible to make any headway in raising the necessary funds. We have not dropped the subject and we are continuing our efforts to work out a plan by which we can make these needed improvements. We shall continue to make this effort regardless of any action which the city council may take but, naturally, after the matter has been brought before the council by the city authorities, unfavorable action by the council will increase the embarrassment of the company in its effort to obtain new capital for the improvements which are so urgently needed."

The improvement and extension program outlined by the gas company calls for construction of an additional gas storage tank of 5,000,000 cu. ft. capacity, coal and coke handling machinery, two additional boilers of 500 h.p. each and improvements to the water gas machinery and equipment. The officials of the company have also agreed that after the foregoing extensions and improvements are installed and financed, they will make others as soon afterward as practical, which are to cost $1,750,000.

The present winter is seeing extreme gas conditions threatening at many Indiana points. Cold weather at Muncie, Ind., recently caused the Central Indiana Gas Company to cut off its gas supply to all industrial consumers as a means of conserving the supply for household purposes.

In spite of this retrenchment the gas company officials say the gas service there may fail. Use of gas will be denied factories until April 15, 1921. Muncie, Hartford City, Eaton and Fairmount were relieved temporarily by the company's order.

Representatives of all Indiana and Ohio cities depending on the Logan Gas and Fuel Company met recently at Dayton, Ohio, in an attempt to devise some method of meeting the fuel situation this winter. Plans were considered to make the gas rates for heating appliances prohibitive in an effort to conserve the various supplies of the natural fuel in that section of the country for domestic users.

THE PITTSBURGH OIL & GAS COMPANY has declared the regular quarterly 2½ per cent dividend, payable Nov. 15, to stock of record, Oct. 31.

N. J. Gas Co. Giving Satisfactory Service with Lower B.t.u. Gas

The Public Utility Commission of New Jersey having lowered the heating value standard for gas to 525 B.t.u., the Consolidated Gas Company of New Jersey, Long Branch, N. J., has taken advantage of this change in standards and during the past month has been supplying gas at the heating value of 525 to 550 B.t.u. In making this change they adjusted the appliances of all of their consumers in order to be sure that they were securing satisfactory service and after making such adjustments a postcard was left with each consumer so that they might report any troubles which would crop out later. It is interesting to note that less than 1 per cent of their consumers sent in these cards indicating that the service was not satisfactory, and of these a large number were due to the increase in the gas rate which went into effect about the same time amounting to 30 cents per thousand. All of these complaints are being followed up and they expect to be able to convince all of their consumers that they can secure just as good service at the lower heating value standard for gas.

It is important to impress on all gas companies where such a change is being made that it is necessary to investigate the condition of the consumer's appliances as the consumer in the average case will assume that the troubles are due to the poor quality of the gas and will not file any complaint at the gas company's office. The consequence will be that the low heating value gas will be given a black eye, which it does not deserve.

Gas Statistics

The annual production of artificial gas for fuel and light to-day is about 800,000,000,000 cu. ft., the gas traveling through 70,000 miles of mains, or nearly enough to circle the equator three times, serving a population of nearly 55,000,000. While gas for lighting dates back nearly 100 years, it has been a standard domestic fuel, particularly in the cities, for less than forty years. Gas companies have had difficulties recently, due to the exceptionally high costs of coal, labor and materials entering into production of the product.

Personal Notes

W. S. QUIGLEY, president, Quigley Furnace Specialties Company, New York City, has just returned from Europe after an extensive trip made in connection with large installations of the Quigley Powdered Coal System in Italy and Belgium.

L. M. KLAUBER, who has recently been promoted to be general superintendent of the San Diego (Cal.) Consolidated Gas & Electric Company, of which he was previously assistant general superintendent, has been with that company since 1911. He was born in San Diego in 1883 and was graduated from Stanford University. From 1908 to 1910 he spent in the Westinghouse Electric & Manufacturing Company's graduate apprentice school at East Pittsburgh, Pa. His first position with the San Diego company was that of new-business solicitor, after which he served as engineer in charge of record department, and assistant general superintendent. Mr. Klauber has been a frequent contributor to the technical press, writing mainly on problems of transmission and distribution. He has also a number of inventions of electric distribution specialties to his credit. He is vice-chairman of the overhead systems committee of the N. E. L. A., a member of the electrical apparatus committee and chairman of the Pacific Coast engineering committee, and he is a member of the A. I. E. E. and several other national technical societies.

E. D. V. DICKEY, has been made manager of the Citizen's Gas Company plant, Hannibal, Mo. He is from Roanoke, Va., where he has been in charge of the gas plant some time. He thoroughly understands the gas industry, having spent a number of years in the work, managing important plants in Illinois, where he was manager of the Freeport Gas Company.

T. C. MCKENZIE, assistant general superintendent of the W. E. Moss Gas Company's properties, who has been in charge of the gas plant in Hannibal, Mo., since the resignation of former Manager Gascoigne, has returned to the home office in Detroit.

H. S. MULLIKEN, of Lexington, Mass., has been appointed metallurgical engineer of the Bureau of Mines, and has been assigned by Dr. F. G. Cottrell, the director, as an assistant to him in special professional work connected with the bureau.

Mr. Mulliken is a graduate of the Worcester Polytechnic Institute, Worcester, Mass. He has been variously connected with mining and metallurgical enterprises as superintendent of the lead smelter at Pilot Bay, British Columbia; superintendent of the American Smelting & Refining Company smelters at Aguas Calientes and Monterrey, Mexico; general superintendent and plant manager of the Penoles Companies at Mapimi, Mexico; for six years in charge of the metallurgical operations of the American Metal Company's interests in Mexico; and later was consulting engineer in metallurgy for the same company with offices at No. 61 Broadway, New York.

E. S. DICKEY, of the Maryland Meter Works of the American Meter Company, Baltimore, Md., is in the Union Protestant Infirmary in Baltimore, where he has undergone an operation for appendicitis.

THOMAS M. RECTOR, formerly in charge of the Division of Food Technology of the Institute of Industrial Research, Washington, D. C., has been appointed director of the Department of Industrial Chemistry of the Peace Laboratories, Inc., 39 West Thirty-eighth Street, New York City. Mr. Rector has been associated in the commercial development of several nationally known products. During the war he served as an officer in the Chemical Warfare Service and was active in the perfection of the American gas mask.

ERNEST C. SCOBELL, auditor of the Gas & Electric Corporation, has been appointed a member of the executive committee of the Empire State Gas & Electric Association for a term of three years. Important problems are ahead for the association to grapple with and considerable responsibility devolves on the members of the committee. It meets monthly in New York City.

CHARLES F. TAYLOR, of Waterloo, Ia., has been appointed head of the gas production department of the Waukesha Gas & Electric Company, Waukesha, Wis.

CLIFTON B. DAY, who has been manager of the Northampton (Mass.) Gas & Electric Light Companies for ten years, has resigned to accept a position with the California Electric Light Company. Mr. Day began as a meter reader for the electric light company and worked himself up until he became manager of both companies.

He has been a wide-awake, up-to-date manager and has the reputation of being one of the best with the Massachusetts Lighting Company. Mr. Day has been active in the Chamber of Commerce and will be greatly missed in Northampton. He expects to leave in a few days and until a manager is appointed Eugene B. Edwards, assistant manager, will take charge of the plants.

CLAY GAS COMPANY, offices at Philippi, Barber County, W. Va.; chief works in Pleasants district, Clay County; to engage in general coal operating; capital stock, $60,000; incorporators, J. W. Reeves and Laura J. Reeves, of Bellington; A. F. Bennett, Cleo Bennett and H. J. Wilcox, of Philippi.

THE WILBUR FUEL COMPANY has just been organized by coal operators and business men of Clarksburg, W. Va., and has obtained a charter from the Secretary of State. The capital stock is $500,000 and the incorporators are M. M. Murphy, K. B. Kyle, Glenn F. Williams, B. B. Jarvis and H. W. Sheets, all of Clarksburg. The company will engage in a general oil, coal and gas business.

THE KOMPAK COMPANY, New Brunswick, N. J., have issued an instruction book designed for fitters and others who may be called upon to connect, repair or adjust their Nos. 18 or 32 Kompak Automatic Water Heaters. It contains chapters on the diaphragm valve, thermostat, adjustment of thermostat, automatic pilot, detailed instructions for connecting heater, starting heater and possible troubles and how to correct them. This booklet was freely distributed at the convention and it will be mailed on request to any gas company.

Gas Company Must Make Refund

The gas rate in Fort Dodge, Iowa, from Nov. 1 and continuing for a year, has been fixed at $1.42 per thousand cubic feet by E. A. Morling, referee in the gas rate controversy between the Fort Dodge Gas & Electric Company and the city of Fort Dodge.

In addition, the company is permitted to make a service charge of 75 cents a month to each consumer.

Thousands of dollars will have to be refunded to consumers by the gas company because of the ruling of Referee Morling that the rate during the past four months, from July 1 to Nov. 1, should be fixed at $1.57. Under the arbitration agreement, the company during the past four months has been charging $1.90, with the understanding that if the referee made a lower rate for the four months, the additional charge would be refunded. Mr. Morling's ruling requires the gas company to refund 33 cents per thousand cubic feet, or 17 per cent of the total bill for four months, "with interest." This means that a consumer having an average gas bill during the past four months of $10 per month or $40 for the four months will have a refund coming from the company of approximately $7.

Mr. Morling fixes the value of the gas company's property in the city at $350,000. The rate is fixed to allow the company to make 8 per cent on this valuation.

The new rate of $1.42 with the service charge of 75 cents a month will give a rate to the average consumer slightly in excess of $1.50, or approximately 40 cents per thousand cubic feet less than the company had said was necessary.

Mr. Morling's decision ends for a year at least the rate controversy between the company and the city which began last summer.

Quincy Gas Association Holds Annual Meeting and Social

A combination of social, business and entertaining meeting was held last week by the Quincy Gas Association, Quincy, Mass. The meeting opened at the Chinese American Restaurant where dinner was served to forty members accompanied by ladies, the guests of the evening.

After the delicious dinner was served, Edward O'Shaughanessy, retiring vice-president, was presented with a mouse-colored derby by his fellow workers, for making the highest and lowest record in one evening's bowling.

The ladies separated from the men and went in a body to the Quincy Theater where special arrangements had been made for them. The gentlemen returned to their quarters where J. Quinn, superintendent, gave an interesting talk. He was followed by W. B. Nichols, president of the gas company, who gave an instructive address. Frank F. Caldwallader, of New York City, explained the uses of gas ranges which was enlightening.

Election of officers was then held which resulted in the following: George W. Ellard, president; Johnnie Moore, vice-president; Nels Nelson, secretary and treasurer. Executive committee was appointed with the above officers and the following: Bert Skellett, Francis Connelly, and Fred Nightingale.

Have Complete New Water-Gas Set

The Alexandria Gas Works of Alexandria, Va., have awarded a contract to the Gas Machinery Company, of Cleveland, Ohio, for a 5-ft. double superheater carbureter water gas apparatus, complete with reverse steam connections, blast apparatus, oil-feed system, steam hoist and fuel buggy for charging the generator and auxiliary equipment.

All the above apparatus will be located in a new building which the gas company will install and the new apparatus will be ready to take care of the rapidly increasing output of the Alexandria Gas Works and enable them to continue the high class of service that has been furnished in the past.

To Sell Gas Bonds

The Railroad Commission has authorized the Twin Cities Gas Company, Beaumont, Cal., to issue $25,000 of stock and $42,500 of bonds to acquire and reconstruct the gas properties formerly owned by Riverside County Gas & Power Company at Banning and Beaumont.

Gas is the oldest utility in the State of Illinois. Chicago was introduced to gas in 1849, but it was several years before it became commonplace and of general use.

New Balloon Gas Not Inflammable

Unburnable gas for use in balloons and dirigibles is the next goal in the navigation of the air, and for that reason the making of helium is attracting unusual interest at present.

Owing to the still high cost of this inert gas experiments are under way to determine how much of it may be employed in combination with the inflammable although far cheaper vapors. The burning qualities of jets of helium and hydrogen are discussed in a report of these researches made by P. G. Ledig of the United States Bureau of Standards in the current number of the *Journal of Industrial and Engineering Chemistry:*

From the beginning of ballooning hydrogen has been used to buoy up the silken bag, despite the fact that it so easily catches fire. During the European war extensive trials were made by firing incendiary bullets into bags filled with helium and it was shown that the inert gas was in no way affected. Large quantities of helium made in northern Texas arrived in New York shortly before the armistice was signed, and they might easily have been employed in filling the giant dirigibles which the English had prepared for the aerial invasion of Germany had the war continued.

Mr. Ledig, in working with his mixtures of hydrogen and helium, has endeavored to perfect a mixture which can safely be used in balloons and airships, both for the needs of war and the traffic of peace. The mixed gases were forced through jets to which flames were applied.

The investigator has concluded that under the most favorable conditions a jet of helium containing more than 24 per cent of hydrogen can be ignited in the air.

Eighteen to 20 per cent of hydrogen may be incorporated with helium, he finds, without producing a mixture which will burn with a persistent flame when issuing from an orifice under the conditions which prevail in ballooning.

More than 20 per cent of hydrogen in a hydrogen-helium mixture cannot be employed in a balloon without sacrificing safety from fire.

With the adoption of a definite formula it is believed that the manufacture of helium compounds will be stimulated and then eventually loss of life from the burning of aerial craft will be no longer possible.